# OBSERVATIONS & RECOMMENDATIONS

After reviewing data collected from **BIG ISLAND POND** the program coordinators recommend the following actions.

### FIGURE INTERPRETATION

- Figure 1: These graphs illustrate concentrations of chlorophyll-a in the water column. Algae are microscopic plants that are a natural part of lake ecosystems. Algae contain chlorophyll-a, a pigment necessary for photosynthesis. A measure of chlorophyll-a can indicate the abundance of algae in a lake. The historical data (the bottom graph) show a stabilizing in-lake chlorophyll-a trend. Algal concentrations in 1998 skewed the historical data, but overall algal abundance has remained the same in the lake. Chlorophyll-a concentrations were well below the NH mean reference line again this season. This is a positive sign for the lake since the increase in rainfall the state experienced would likely have washed excess nutrients into the lake which could have caused excess algal growth. We are pleased to report that no excess algal growth was apparent as it was with the wet weather of 1998. While algae are present in all lakes, an excess amount of any type is not welcomed. Concentrations can increase when there are external and internal sources of phosphorus, which is the nutrient algae depend upon for growth. It's important to continue the education process and keep residents aware of the sources of phosphorus and how it influences lake quality.
- Figure 2: Water clarity is measured by using a Secchi disk. Clarity, or transparency, can be influenced by such things as algae, sediments from erosion, and natural colors of the water. The graphs on this page show historical and current year data. The lower graph shows a *fairly stable* trend in lake transparency. June transparency results were low due to weather conditions during sampling. Water clarity in July was above the NH mean reference line, and mean transparency remained above the average for NH lakes and ponds. The 2000 sampling season was considered to be wet and, therefore, average transparency readings are expected to be slightly lower than last year's readings. Higher amounts of rainfall usually cause more eroding of sediments into the lake and streams, thus decreasing clarity.

> Figure 3: These figures show the amounts of phosphorus in the epilimnion (the upper layer in the lake) and the hypolimnion (the lower layer); the inset graphs show current year data. Phosphorus is the limiting nutrient for plants and algae in New Hampshire waters. Too much phosphorus in a lake can lead to increases in plant growth These graphs show a stabilizing trend for in-lake over time. phosphorus levels. Phosphorus concentrations this season remained below the median value for NH lakes, and showed no alarming signs of increasing to undesirable levels. One of the most important approaches to reducing phosphorus levels is educating the public. Humans introduce phosphorus to lakes by several means: fertilizing lawns, septic system failures, and detergents containing phosphates are just a few. Keeping the public aware of ways to reduce the input of phosphorus to lakes means less productivity in the lake. Contact the VLAP coordinator for tips on educating your lake residents or for ideas on testing your watershed for phosphorus inputs.

### **OTHER COMMENTS**

- Conductivity in Campground Inlet increased again this season (Table 6). Conductivity was elevated last season possibly as a result of the dry weather and nutrient accumulation in the Inlet, and we had hoped to see the conductivity decrease with the return of rainfall. However, conductivity continued to increase with the wet weather, and it is likely that excess nutrients were washed into the Inlet from the watershed. Conductivity increases often indicate the influence of human activities on surface waters. Septic system leachate, agricultural runoff, iron deposits, and road runoff can all influence conductivity. It would be useful to uncover the reasons for increased conductivity as we continue to monitor the pond. Monitors may want to consider conducting extra sampling to bracket the stream. If monitors would like to do so please contact the VLAP coordinator at 271-2658 to arrange this during the annual lake visit.
- The process of decomposition in the sediments depletes dissolved oxygen on the bottom of thermally stratified lakes. As bacteria break down organic matter, they deplete oxygen in the water. When oxygen gets below 1 mg/L, phosphorus normally bound up in the sediments may be released into the water column, a process that is referred to as *internal loading*. Depleted oxygen in the hypolimnion usually occurs as the summer progresses. Dissolved oxygen was depleted in the last three meters of the pond this season, and was approaching the critical level of 1.0 mg/L below 5 meters from the surface of the pond. This explains the higher phosphorus in the hypolimnion (lower water layer) versus the epilimnion (upper layer). Since an internal source of phosphorus to the lake is present, limiting or eliminating external phosphorus sources in the lake's watershed is even more important for lake protection.

- ➤ In 2000, small amounts of the blue-green algae *Coelosphaerium* were observed in the plankton sample. Blue-green algae can reach nuisance levels when sufficient nutrients and favorable environmental conditions are present. While overall algae abundance continues to be low in the lake, the presence of these indicator species should serve as a reminder of the lake's delicate balance. Continued care to protect the watershed by limiting or eliminating fertilizer use on lawns, keeping the lake shoreline natural, and properly maintaining septic systems and roads will keep algae populations in balance.
- ➤ E. coli originates in the intestines of warm-blooded animals (including humans) and is an indicator of associated and potentially harmful pathogens. Bacteria concentrations were slightly elevated in Taylor Inlet throughout the summer, however levels remained below the state standard of 406 counts per 100 mL (Table 12). E.coli concentrations at all other sites remained low this season. If residents are concerned about septic system impacts, testing when the water table is high or after rains is best. Please consult the Other Monitoring Parameters section of the report for the current standards for E. coli in surface waters.

### Notes

- ➤ Monitor's Note (6/21/00): Slight waves made Secchi reading difficult, wind picking up.
- $\blacktriangleright$  Monitor's Note (7/20/00): No rain for 4 days.
- ➤ Monitor's Note (8/16/00): Raining prior to testing. Lake level up 2 ft.

#### USEFUL RESOURCES

A Guide to Developing and Re-Developing Shoreland Property in New Hampshire: A Blueprint to Help You Live By the Water. North Country RC&D, 1994. (603) 527-2093.

A Brief History of Lakes, NH Lakes Association pamphlet, (603) 226-0299 or www.nhlakes.org

Anthropogenic Phosphorus and New Hampshire Waterbodies, NHDES-WSPCD-95-6, NHDES Booklet, (603) 271-3503

Nonpoint Source Pollution and Stormwater Fact Sheet Package. Terrene Institute. (703) 661-1582.

Bacteria in Surface Waters, WD-BB-14, NHDES Fact Sheet, (603) 271-3503 or <a href="https://www.state.nh.us">www.state.nh.us</a>

The Watershed Guide to Cleaner Rivers, Lakes, and Streams, Connecticut River Joint Commissions, 1995. (603) 826-4800

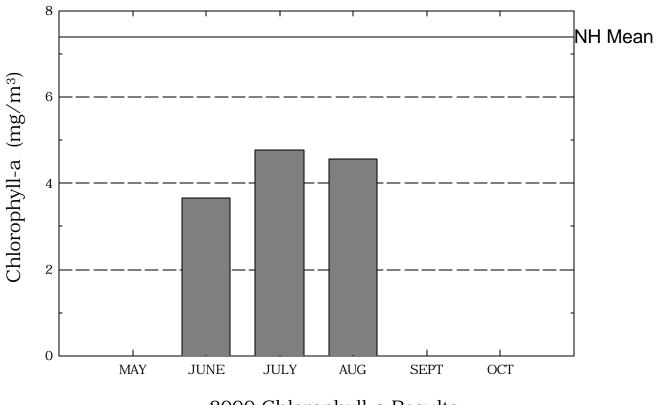
Road Salt and Water Quality, WD-WSQB-7, NHDES Fact Sheet, (603) 271-3503 or <a href="https://www.state.nh.us">www.state.nh.us</a>

Weed Watchers: An Association to Halt the Spread of Exotic Aquatic Plants, WD-BB-4, NHDES Fact Sheet, (603) 271-3503 or <a href="https://www.state.nh.us">www.state.nh.us</a>

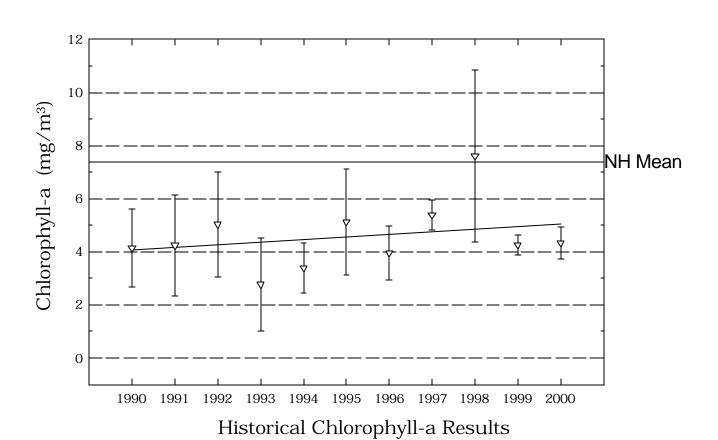
*The Blue Green Algae*. North American Lake Management Society, 1989. (608) 233-2836 or www.nalms.org

## Big Island Pond

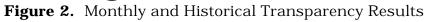
Figure 1. Monthly and Historical Chlorophyll-a Results

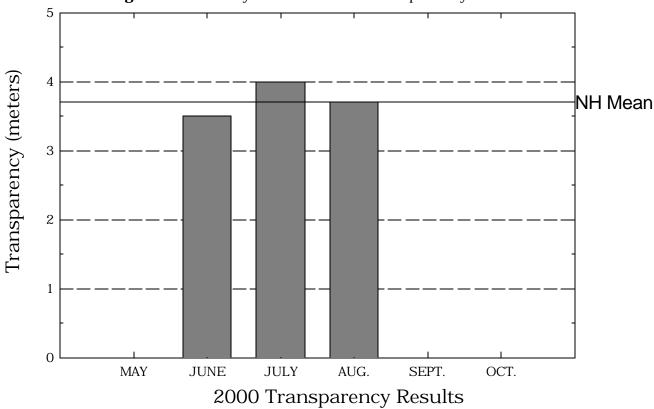


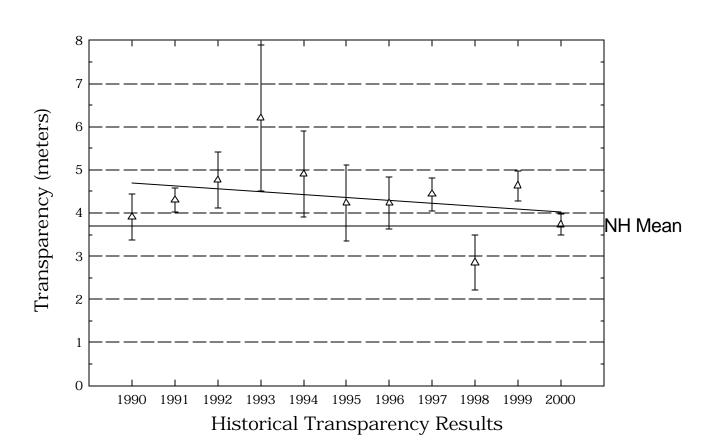
2000 Chlorophyll-a Results



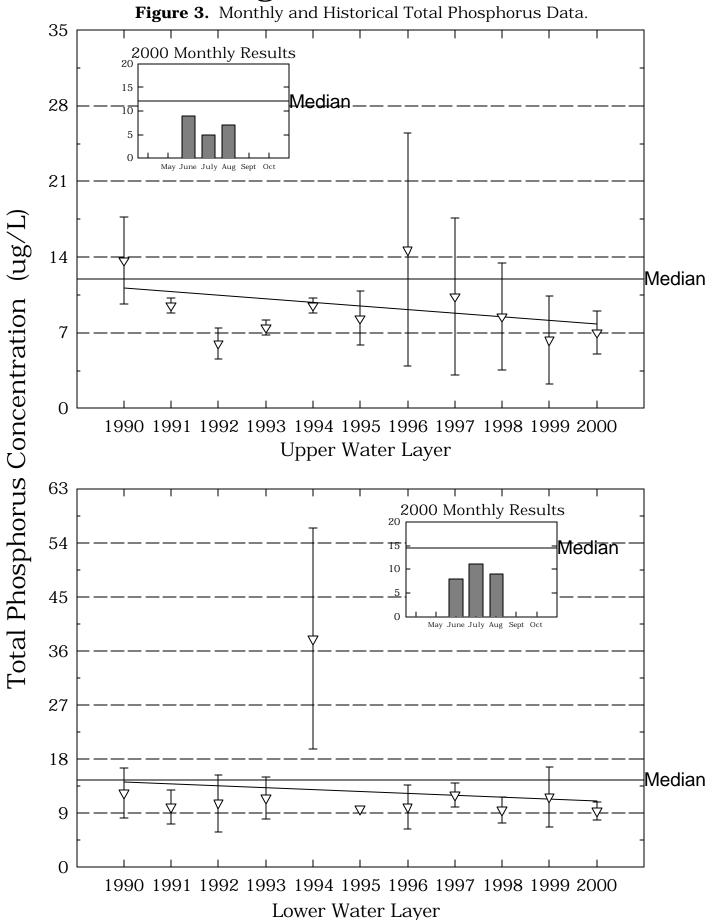
## Big Island Pond







## Big Island Pond



## Table 1. ISLAND POND, BIG

DERRY

## Chlorophyll-a results (mg/m $\,$ ) for current year and historical sampling periods.

Year	Minimum	Maximum	Mean
1990	2.56	5.50	4.14
1991	2.90	5.57	4.23
1992	3.63	7.28	5.03
1993	1.52	4.01	2.76
1994	2.72	4.05	3.38
1995	2.92	6.76	5.12
1996	2.92	4.95	3.96
1997	4.79	5.88	5.39
1998	5.31	9.91	7.61
1999	3.84	4.53	4.26
2000	3.65	4.77	4.32

#### Table 2.

### ISLAND POND, BIG DERRY

### Phytoplankton species and relative percent abundance.

### Summary for current and historical sampling seasons.

		Relative %
Date of Sample	Species Observed	Abundance
06/04/1990	ASTERIONELLA	63
	SYNURA	7
09/04/1991	CERATIUM	35
	DINOBRYON	18
06/18/1992	CERATIUM	20
	DINOBRYON	17
	SYNURA	17
08/20/1993	CERATIUM	63
	CHRYSOSPHAERELLA	8
07/11/1994	CERATIUM	54
	DINOBRYON	16
	STAURASTRUM	11
07/11/1995	ASTERIONELLA	31
	CERATIUM	26
	CHRYSOSPHAERELLA	9
08/12/1996	CERATIUM ASTERIONELLA	53 9
	DINOBRYON	9
07/15/1997	SYNURA	42
	CERATIUM	32
	DINOBRYON	9
08/19/1998	SYNURA	60
	CHRYSOSPHAERELLA	19 8
	TABELLARIA	8
08/17/1999	CERATIUM	68
	TABELLARIA	11
	SYNURA	7
08/16/2000	DINOBRYON CERATIUM	38 16
	SYNURA	15
	<del></del>	10

## Summary of current and historical Secchi Disk transparency results (in meters).

Year	Minimum	Maximum	Mean
1000		A 5	
1990	3.5	4.5	3.9
1991	4.1	4.5	4.3
1992	4.3	5.5	4.7
1993	5.0	7.4	6.2
1994	4.2	5.6	4.9
1995	3.5	5.2	4.2
1996	3.6	4.8	4.2
1997	4.0	4.7	4.4
1998	2.4	3.3	2.8
1999	4.3	5.0	4.6
2000	3.5	4.0	3.7

Station	Year	Minimum	Maximum	Mean
CAMPGROUND INLET				
	1000	7.09	7.10	7.10
	1992	7.02	7.19	7.10
	1993	7.31 6.94	7.49 7.27	7.39
	1994			7.07
	1995	6.89	7.01	6.94
	1996	6.86	6.91	6.88
	1997	6.77	7.02	6.85
	1998	6.92	7.03	6.97
	1999	6.75	6.79	6.76
DREW INLET				
	1000	6.66	6.73	6.60
	1990	6.67	7.20	6.69
	1991			6.86
	1992	6.68 6.91	6.91	6.76
	1993		6.93 6.90	6.92
	1994	6.65		6.76
	1995	6.69	7.01	6.82
	1996	6.33	6.64	6.51
	1997	6.66	6.89	6.75
	1998	6.54	6.62	6.58
	1999	6.74	6.84	6.80
	2000	6.58	6.78	6.68
EPILIMNION				
	1990	6.86	7.23	7.06
	1991	7.05	7.32	7.16
	1992	7.15	7.21	7.18

Table 4.

ISLAND POND, BIG

DERRY

Station	Year	Minimum	Maximum	Mean
	1993	7.27	7.31	7.29
	1994	6.88	7.22	7.02
	1995	7.02	7.22	7.12
	1996	6.84	6.95	6.90
	1997	6.92	7.18	7.04
	1998	6.82	6.98	6.89
	1999	6.86	7.03	6.96
	2000	6.92	7.00	6.95
HYPOLIMNION				
	1990	6.30	6.65	6.45
	1991	6.34	6.65	6.47
	1992	6.40	6.60	6.52
	1993	6.29	6.32	6.30
	1994	6.32	6.52	6.41
	1995	6.25	6.56	6.41
	1996	6.17	6.40	6.28
	1997	6.31	6.39	6.36
	1998	6.10	6.14	6.12
	1999	6.25	6.46	6.35
	2000	6.32	6.40	6.35
METALIMNION				
	1990	6.82	7.33	6.95
	1991	6.36	6.99	6.57
	1992	6.82	7.07	6.90
	1993	6.48	6.49	6.48
	1994	6.34	6.82	6.52

Station	Year	Minimum	Maximum	Mean
	1995	6.35	6.66	6.53
	1996	6.18	6.51	6.37
	1997	6.65	6.82	6.74
	1998	6.13	6.14	6.13
	1999	6.56	6.91	6.67
	2000	6.40	6.48	6.44
MOUTH SHOP BROOK				
	2000	6.86	6.95	6.91
OUTLET				
	1990	7.05	7.23	7.15
	1991	7.06	7.06	7.06
	1992	6.99	7.26	7.10
	1993	7.23	7.40	7.31
	1994	7.03	7.04	7.04
	1995	7.09	7.30	7.16
	1996	6.84	7.02	6.92
	1997	6.96	7.20	7.06
	1998	6.94	6.94	6.94
	1999	7.07	7.19	7.13
	2000	6.97	6.97	6.97
SHOP INLET				
	1996	6.87	6.87	6.87
SHOP OUTLET				
	1996	6.96	6.96	6.96

Table 4.

ISLAND POND, BIG

DERRY

Station	Year	Minimum	Maximum	Mean
SUNSET OUTLET				
	1996	7.04	7.04	7.04
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TAYLOR INLET				
	1990	6.73	6.98	6.85
	1991	6.74	7.21	6.91
	1992	6.74	7.08	6.87
	1993	6.89	7.01	6.95
	1994	6.78	6.93	6.85
	1995	6.78	7.04	6.90
	1996	6.54	6.86	6.69
	1997	6.74	7.07	6.84
	1998	6.62	6.89	6.73
	1999	6.81	6.85	6.84
	2000	6.46	6.77	6.62

### Table 5.

### ISLAND POND, BIG DERRY

## Summary of current and historical Acid Neutralizing Capacity. Values expressed in mg/L as CaCO .

### **Epilimnetic Values**

Year	Minimum	Maximum	Mean
1990	8.80	10.70	10.07
1991	10.10	11.60	10.85
1992	11.00	12.30	11.67
1993	11.40	11.40	11.40
1994	8.90	9.90	9.40
1995	10.06	11.40	10.62
1996	8.10	10.00	9.30
1997	9.40	10.80	10.17
1998	10.20	10.40	10.30
1999	9.80	11.30	10.55
2000	8.80	12.00	10.60

### Table 6.

### ISLAND POND, BIG DERRY

Station	Year	Minimum	Maximum	Mean
CAMPGROUND INLET				
	1992	179.6	215.3	195.6
	1993	218.3	221.0	219.6
	1994	234.0	236.4	235.2
	1995	154.4	169.4	163.3
	1996	138.4	225.8	178.9
	1997	160.0	220.0	186.4
	1998	178.8	182.7	180.7
	1999	192.8	208.7	203.0
DREW INLET				
	1990	130.2	146.6	140.6
	1991	126.8	138.2	132.5
	1992	134.5	140.1	137.9
	1993	146.1	153.1	149.6
	1994	153.5	166.3	159.9
	1995	119.2	149.2	138.0
	1996	141.8	168.3	157.5
	1997	147.2	153.5	150.6
	1998	133.9	142.2	138.0
	1999	174.3	177.0	175.7
	2000	151.9	166.5	160.4
EPILIMNION				
	1990	128.0	131.6	129.2
	1991	118.8	126.5	122.6
	1992	132.2	133.7	133.0

## Table 6. ISLAND POND, BIG

DERRY

Station	Year	Minimum	Maximum	Mean
	1993	139.0	140.0	139.5
	1994	141.3	143.4	142.3
	1995	141.6	147.5	144.6
	1996	148.7	153.2	151.1
	1997	149.3	152.3	150.9
	1998	125.3	126.2	125.7
	1999	162.9	167.3	165.5
	2000	162.5	164.1	163.3
HYPOLIMNION				
	1990	122.5	125.8	124.3
	1991	124.2	124.6	124.4
	1992	126.9	130.0	128.6
	1993	130.7	133.0	131.8
	1994	138.4	138.6	138.5
	1995	136.1	138.2	137.4
	1996	140.6	144.4	142.5
	1997	134.6	141.2	137.3
	1998	142.6	148.3	145.4
	1999	151.5	157.9	153.7
	2000	160.4	161.6	161.1
METALIMNION				
	1990	124.9	129.6	127.2
	1991	124.9	125.2	125.0
	1992	130.9	134.1	132.8
	1993	131.2	134.0	132.6
	1994	140.8	141.4	141.1

### Table 6.

### ISLAND POND, BIG DERRY

Station	Year	Minimum	Maximum	Mean
	1995	138.2	139.5	138.9
	1996	142.0	149.7	145.4
	1997	143.0	143.6	143.2
	1998	125.6	130.5	128.0
	1999	155.4	164.1	159.5
	2000	162.6	163.2	163.0
MOUTH SHOP BROOK				
	2000	217.0	286.0	244.3
OUTLET				
	1990	125.3	129.8	127.8
	1991	118.9	118.9	118.9
	1992	132.2	135.2	133.7
	1993	136.1	139.9	138.0
	1994	141.6	147.3	144.4
	1995	141.9	215.0	168.3
	1996	150.8	159.9	154.1
	1997	141.6	149.5	145.3
	1998	131.1	131.1	131.1
	1999	166.2	167.9	167.0
	2000	162.1	162.1	162.1
SHOP INLET				
	1996	220.5	220.5	220.5
SHOP OUTLET				
	1996	228.9	228.9	228.9

## Table 6. ISLAND POND, BIG

**DERRY** 

Station	Year	Minimum	Maximum	Mean
CLINICET OLITEET				
SUNSET OUTLET	1996	248.0	248.0	248.0
TAYLOR INLET				
TATLORINLET	1990	136.7	147.8	140.8
	1991	114.1	129.4	121.7
	1992	135.3	144.1	138.3
	1993	143.8	145.7	144.7
	1994	165.9	180.5	173.2
	1995	142.2	160.8	149.7
	1996	157.9	171.2	165.4
	1997	150.4	158.1	154.3
	1998	127.7	129.9	128.8
	1999	172.9	191.6	179.6
	2000	158.9	166.1	161.9

Station	Year	Minimum	Maximum	Mean
CAMPGROUND INLET				
	1992	10	20	14
	1993	12	65	38
	1994	17	22	19
	1995	14	17	15
	1996	7	12	9
	1997	10	81	39
	1998	18	44	31
	1999	8	27	20
DREW INLET				
	1990	15	36	25
	1991	7	25	16
	1992	15	16	15
	1993	16	22	19
	1994	13	23	18
	1995	9	20	13
	1996	16	20	17
	1997	13	19	15
	1998	15	21	18
	1999	9	17	13
	2000	14	18	16
EPILIMNION				
	1990	10	18	13
	1991	9	10	9
	1992	5	7	6

Station	Year	Minimum	Maximum	Mean
	1993	7	8	7
	1994	9	10	9
	1995	6	11	8
	1996	7	27	14
	1997	2	15	10
	1998	5	12	8
	1999	2	10	6
	2000	5	9	7
HYPOLIMNION				
	1990	9	17	12
	1991	8	12	10
	1992	7	16	10
	1993	9	14	11
	1994	25	51	38
	1995	9	10	9
	1996	7	14	10
	1997	10	14	12
	1998	8	11	9
	1999	7	17	11
	2000	8	11	9
METALIMNION				
	1990	9	14	12
	1991	7	15	11
	1992	8	11	10
	1993	13	14	13
	1994	5	6	5

Station	Year	Minimum	Maximum	Mean
	1995	6	9	7
	1996	7	10	9
	1997	6	13	10
	1998	5	9	7
	1999	4	12	8
	2000	5	11	7
MOUTH SHOP BROOK				
	2000	10	15	12
OUTLET				
	1990	11	39	20
	1991	8	9	8
	1992	10	16	13
	1993	8	10	9
	1994	10	15	12
	1995	7	14	9
	1996	3	10	7
	1997	3	12	7
	1998	10	10	10
	1999	1	9	5
	2000	8	8	8
SHOP OUTLET				
	1996	12	12	12
TAYLOR BK UP				
	1996	15	15	15

Station	Year	Minimum	Maximum	Mean
TAYLOR INLET				
	1990	16	16	16
	1991	11	15	13
	1992	7	10	8
	1993	12	15	13
	1994	17	22	19
	1995	10	20	13
	1996	15	29	22
	1997	8	21	16
	1998	9	14	11
	1999	6	13	10
	2000	12	18	14

### Current year dissolved oxygen and temperature data.

Depth (meters)	Temperature (celsius)	Dissolved Oxygen (mg/L)	Saturation (%)
		August 16, 2000	
0.1	22.9	7.5	87.0
1.0	22.7	7.4	86.1
2.0	22.6	7.3	84.5
3.0	22.6	7.3	84.2
4.0	22.5	7.1	82.2
5.0	20.7	3.5	38.7
6.0	17.5	1.3	13.3
7.0	14.1	1.0	9.4
8.0	11.8	1.3	12.0
9.0	10.7	1.9	17.2
10.0	10.1	1.9	17.0
11.0	9.6	2.5	22.0
12.0	9.4	2.3	20.5
13.0	9.3	2.2	18.9
14.0	9.2	1.8	15.7
15.0	9.1	1.5	13.1
16.0	9.0	1.4	12.3
17.0	9.0	1.2	10.3
18.0	9.0	1.0	8.8
19.0	8.9	0.8	7.3
20.0	8.9	0.8	6.8
21.0	10.3	0.9	7.6

Table 10.

ISLAND POND, BIG

DERRY

### Historic Hypolimnetic dissolved oxygen and temperature data.

Date	Depth	Temperature	Dissolved Oxygen	Saturation
	(meters)	(celsius)	(mg/L)	(%)
June 4, 1990	14.0	7.5	8.5	70.6
August 15, 1990	24.0	6.8	0.5	4.1
September 4, 1991	22.0	7.1	0.1	0.8
June 18, 1992	23.5	6.3	7.2	58.1
August 25, 1992	23.5	6.8	0.7	5.7
August 20, 1993	22.0	6.5	0.8	6.0
July 11, 1994	23.0	6.7	4.9	39.0
July 11, 1995	23.0	6.0	4.4	33.0
August 17, 1995	21.0	6.8	0.2	2.0
August 12, 1996	24.0	8.0	0.2	2.0
July 15, 1997	24.0	7.0	1.6	13.0
October 9, 1997	25.0	7.9	0.3	2.0
August 19, 1998	23.0	7.4	0.3	2.0
August 17, 1999	21.0	8.4	0.6	5.4
August 16, 2000	21.0	10.3	0.9	7.6

## Summary of current year and historic turbidity sampling. Results in NTU's.

Station	Year	Minimum	Maximum	Mean
CAMPGROUND INLET				
	1997	0.7	4.5	2.0
	1998	0.6	2.3	1.4
	1999	1.0	1.8	1.3
DREW INLET				
	1997	0.5	0.8	0.6
	1998	0.7	1.3	1.0
	1999	0.8	1.1	1.0
	2000	0.5	0.8	0.7
EPILIMNION				
	1997	0.2	0.4	0.3
	1998	0.3	0.6	0.5
	1999	0.4	0.6	0.5
	2000	0.3	0.3	0.3
HYPOLIMNION				
	1997	0.5	1.9	1.2
	1998	1.8	4.9	3.3
	1999	1.4	5.6	3.5
	2000	0.9	2.2	1.5
METALIMNION				
	1997	0.3	0.5	0.4
	1998	0.3	0.7	0.5
	1999	0.5	0.9	0.6
	2000	0.4	0.6	0.5
MOUTH SHOP BROOK				
	2000	0.6	0.8	0.7

Table 11.

ISLAND POND, BIG

DERRY

## Summary of current year and historic turbidity sampling. Results in NTU's.

Station	Year	Minimum	Maximum	Mean
OUTLET				
001221				
	1997	0.4	1.0	0.6
	1998	1.1	1.1	1.1
	1999	0.6	0.7	0.6
	2000	0.4	0.4	0.4
TAYLOR INLET				
	1997	0.6	0.9	0.8
	1998	0.7	0.8	0.7
	1999	0.6	1.1	0.8
	2000	0.7	0.9	0.8

#### Table 12.

### ISLAND POND, BIG

### **DERRY**

### Summary of current year bacteria sampling. Results in counts per 100ml.

Location	Date	<b>E. Coli</b> See Note Below
CAMPGROUND INLET		
	August 16	30
CONLEY GROUP DOHERTY		_
	July 20	2
CONLEY'S GROVE; DORITY	August 16	1
DREW BK BACTERIA		
	July 20	9
DREW INLET		
	June 21	20
	August 16	9
GERMANTOWN	I 01	0
MOLITI I CLIOD DDOOV	June 21	3
MOUTH SHOP BROOK	June 21	6
SHOT BK BACTERIA		
	July 20	5
SMALL BEACH		
	June 21	2
TAYLOR BK BACTERIA	July 20	53
TAYLOR BK MOUTH BACTERIA	July 20	30
	July 20	5
TAYLOR INLET		
	June 21	77
	August 16	63